



Federal Aviation Administration

Memorandum

Date: October 18, 2010

To: Manager, Transport Standards Staff, International Branch, ANM-116

From: Manager, Transport Standards Staff, Propulsion/Mechanical Systems Branch, ANM-112

Prepared by: Steve Happenny, Aerospace Engineer, ANM-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for High Altitude Landing Operations for Embraer EMB-135BJ (TD0765IB-T)

ELOS Memo#: TD0765IB-T-S-1 Revision A

Regulatory Ref: § 21.21(b)(1); 25.841(a) and (b)(6)

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate on the establishment of an equivalent level of safety finding for the Embraer airplane model EMB-135BJ.

Background

We have received the National Agency of Civil Aviation (ANAC) letter 789/2010/GGCP/SAR-ANAC dated June 21, 2010, which provides ANAC's Statement of Compliance, also dated June 21, 2010, for the following Embraer Design Change Approval (DCA):

0145-000-00050-2009/FAA, Revision A, dated March 24, 2010, "Takeoff And Landing Altitude Envelope Extension From 9,500 FT to 13,800 FT."

The ANAC statement of compliance (SOC) to the established Federal Aviation Administration (FAA) certification basis as defined in Type Certificate Data Sheet (TCDS) T00011AT, included an Equivalent Level of Safety (ELOS) finding for Title 14 Code of Federal Regulations (CFR) 25.841(a) & (b)(6) based on the ANAC issue paper (FCAR) HIS-02. This ELOS finding is similar to the FAA ELOS finding documented in memo AT0134IB-T-S-1, which was also based on the ANAC FCAR HIS-02. FAA, in accordance with the provisions of § 21.21 (b)(1), and the ANAC ELOS finding, reviewed the Embraer request for an equivalent level of safety to the applicable regulations when applied to the Embraer EMB-135BJ model airplanes to operate at airports with an elevation up to 13,500 feet.

However, due to a misunderstanding concerning Embraer information provided (reference GCF-0261/2010), our interpretation was that an equivalent level of safety to the applicable regulations for the Embraer EMB-135BJ model airplanes was sought to operate at airports with an elevation up to 13,500 feet. This was not the case. In subsequent discussions, Embraer clarified their request, and assured that their original intent was to include airports with an elevation up to 13,800 feet. Embraer submitted a letter explaining the misunderstanding (reference GCF-0964/2010) and documenting their design and analysis. As the design margins on the pressurization and oxygen systems afford adequate protection up to an altitude that accommodates a maximum field altitude of 13,800 feet, FAA has determined that extending the airplane operation is acceptable. Therefore, we are revising the original ELOS Memo.

As with AT0134IB-T-S-1, the FAA's ELOS finding for this modification will also be recorded (i.e., the ELOS memorandum number) in the Type Certificate Data Sheet. This approval is in accordance with Title 14 CFR § 21.29 and our Bilateral Aviation Safety Agreement – Implementation Procedures for Airworthiness between Brazil and the United States of America.

Applicable regulation(s)

§§ 21.21(b)(1); 25.841(a), and (b)(6)

Regulation(s) requiring an ELOS

§§ 25.841(a) and (b)(6)

Description of compensating design features or alternative standards that allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

Embraer has shown in the associated ANAC ELOS finding for Title 14 CFR 25.841(a) & (b)(6) based on the ANAC issue paper (FCAR) HIS-02; and, via separate communication between ANAC and FAA that the Embraer EMB-135BJ affords design features and operational procedures that allow granting the ELOS. This ELOS finding is similar to the FAA ELOS finding documented in memo AT0134IB-T-S-1, which was also based on the ANAC FCAR HIS-02. The Embraer cabin pressure controller and associated pressurization system, the dual limit cabin altitude warning system, and the operational procedures used when operating at a high altitude airport follow common industry practice which has been shown to result in an appropriate level of safety for passengers and crew. FAA has approved other ELOS findings based on these features and procedures. The Transport Airplane Directorate believes that it is appropriate to use an equivalent level of safety finding for §§ 25.841(a) and (b)(6).

Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

The cabin altitude must equal the airport elevation when departing or landing. Embraer EMB-135BJ model airplanes have a cabin pressure controller, dual limit cabin altitude warning system, and associated flight deck selector switch for high altitude airport operations, which will allow normal takeoffs and landings at those at elevations up to 13,800 feet (within tolerance of the applicable pressure sensors). The cabin pressure controller and associated pressurization system will quickly bring the cabin pressure level to meet the 8,000 foot cabin pressure level (i.e., maximum duration of deviation is less

than 20 minutes from the maximum airport altitude of 13,800 feet). The dual limit cabin altitude warning system shifts the warning to a higher altitude (i.e., lower) pressure when operating at high altitude airports. The combination of this design change and operational procedures (i.e., §§ 91.211, 121.329(b), and 135.89(b)(1) address the use of oxygen to prevent hypoxia and related degraded pilot performance) ensures an acceptable level of safety from descent into a high altitude airport, such that upon landing the airplane will be unpressurized and the cabin doors may be opened, as well as the reestablishment of "normal" cabin pressure control following takeoff from a high altitude airport.

The Embraer design mitigates this exposure by limiting high altitude crew procedure to only conditions where the High Altitude Operation is required. Pilot procedures to don oxygen address crew exposure. High cabin altitude exposure to passengers (and crew) only exists when High Altitude Operation is invoked, which should only occur when crew are preparing for descent into or out of high altitude airport, and not during cruise operations. Take-off exposure is mitigated by crew procedure to select normal landing altitude mode (or select landing altitude to destination airport). Passenger and crew exposure to altitudes above 8,000 feet pressure level are limited to 13,800 feet (within tolerance of the applicable pressure sensors), of short duration and the normal cabin altitude limit is quickly reestablished.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding as documented in ANAC issue paper (FCAR) HIS-02 [Reference: FAA Cover Issue Paper S-1 for project TD0765IB-T]. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Airplane Directorate (TAD) has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS.

This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section. [e.g., Equivalent Safety Findings have been made for the following regulation(s):

§§ 25.841(a) and (b)(6) – "High Altitude Landing Operations" (documented in Transport Airplane Directorate ELOS Memo TD0765IB-T-S-1)]



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Transport Standards Staff,

OCTOBER 18, 2010

Date

ELOS Originated by: Standards Staff, Mechanical Systems Branch	Project Engineer: Steven Happenny	Routing Symbol: ANM-112
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